



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/527,347	03/10/2005	Derek John Fray	R.G.106	7234
23557	7590	01/20/2011	EXAMINER	
SALIWANCHIK, LLOYD & EISENSCHENK A PROFESSIONAL ASSOCIATION PO Box 142950 GAINESVILLE, FL 32614				SALZMAN, KOURTNEY R
ART UNIT		PAPER NUMBER		
1724				
			NOTIFICATION DATE	DELIVERY MODE
			01/20/2011	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

[euspto@slepatents.com](mailto:euspto@slepatents.com)

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/527,347	FRAY ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	KOURTNEY R. SALZMAN	1724	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) Responsive to communication(s) filed on 05 November 2010.
- 2a) This action is **FINAL**.                    2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) Claim(s) 1-3,6,9-21,29 and 32-37 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1-3,6,9-21,29 and 32-37 is/are rejected.
- 7) Claim(s) \_\_\_\_\_ is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ .                                    |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date. _____ .   | 6) <input type="checkbox"/> Other: _____ .                        |

## DETAILED ACTION

### ***Response to Amendment***

1. The amendment filed November 5, 2010 has been entered.
2. Claims 1, 6 and 21 have been amended. Claims 30 and 31 have been cancelled.  
Claims 32-37 have been added.
3. Claims 1-3, 6, 9-21, 29 and 32-37 are currently pending and have been fully considered.

### ***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

5. Claims 1-3, 6, 9-12 and 17-21 rejected under 35 U.S.C. 102(a) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over SCHWANDT et al (C. Schwandt, D.J. Fray, M.P. Hills, M.A. Henson, R.M. Henson and C. Powell, 6<sup>th</sup> International American Foundry Society Conference, Orlando, FL, 2001. American Foundry Society)

Regarding claim 1, SCHWANDT et al teaches a hydrogen sensor for use in molten aluminum and its alloys in the abstract. The second full paragraph in the section titled “The Novel Hydrogen Analyser”, the sensor is said to have a perovskite electrolyte in conjunction with a zirconium/hydrogen mixture, operating at a temperature above 550 degrees Celsius. A seal is shown to be used in

figure 1. SCHWANDT et al teaches in the second paragraph of section “The novel Hydrogen Analyser” for two phases of  $\beta$  and  $\delta$  zirconium will be present. Since these two phases will be present, it is inherent the necessary amount of hydrogen is sufficiently present. Since SCHWANDT et al discloses a fully functioning sensor (see fig. 1 and 3), the content of oxygen in SCHWANDT et al is such that the solid electrolyte is substantially chemically stable giving the claim language its broadest reasonable interpretation. As disclosed by the applicant, since there is no change in oxygen concentration during processing and most metal manufacturers will presumably report impurity concentrations of its metal, including the concentration of oxygen, then the oxygen content or distribution in SCHWANDT et al would also have thereby been inherently sufficient to fulfill the requirements of the instant application by simply looking at the material data sheet for its purchased metal. Moreover, the desirable amount of oxygen would be inherent to the functioning sensor. In the alternative, as disclosed by the applicant in multiple locations (both the remarks and specification), the oxygen level of the used zirconium is that of a commercial product. Therefore, the broadest reasonable interpretation of the zirconium used is that of a commercial product would also be used in SCHWANDT et al; where the level would be known. Furthermore, the range of oxygen present is an open ended range in the direction of increasing oxygen content. Therefore, it would have been obvious to try and most likely to choose a zirconium material with an oxygen content greater

than that of 1010 ppm as there would be more available commercial products with oxygen contents in a larger range.

Regarding claims 2 and 3, SCHWANDT et al teaches a calcium zirconate partially substituted or doped in the second paragraph of the section “The Novel Hydrogen Analyser”.

Regarding claim 6, in the second paragraph of section “The novel Hydrogen Analyser” the two phases of  $\beta$  and  $\delta$  zirconium will be present.

Regarding claims 9-10, when heated the zirconium hydride of the reference standard will react with any oxygen present at the interface between the electrolyte and electrode, forming various oxide layers at the surface. Prevention of the reaction of the solid electrolyte and the reference is a key to the stable operation of the sensor and maintaining a known hydrogen partial pressure as addressed in the section “The Novel Hydrogen Analyser”.

Regarding claims 11 and 12, figure 1 shows a platinum coating and are described in the second paragraph of section “The Novel Hydrogen Analyser”.

Regarding claims 17 and 18, the same apparatus is created regardless of which order the steps are performed. Therefore, since these are apparatus claims, the

stable finished sensor of SCHWANDT et al fulfills these claims. Moreover, the Introduction and "The Novel Hydrogen Analyzer" sections sufficiently describe assembly.

Regarding claim 19 and 20, the first paragraph of the section titled "Measurements and Results" teaches these steps including the preconditioning or "routine check" of SCHWANDT et al.

Regarding claim 21, SCHWANDT et al teaches a hydrogen sensor for use in molten aluminum and its alloys in the abstract. The second full paragraph in the section titled "The Novel Hydrogen Analyser", the sensor is said to have a perovskite electrolyte in conjunction with a zirconium/hydrogen mixture, operating at a temperature above 550 degrees Celsius. A seal is shown to be used in figure 1. SCHWANDT et al teaches in the second paragraph of section "The novel Hydrogen Analyser" for two phases of  $\beta$  and  $\delta$  zirconium will be present. Since these two phases will be present, it is inherent the necessary amount of hydrogen is sufficiently present. Since SCHWANDT et al discloses a fully functioning sensor (see fig. 1 and 3), the content of oxygen in SCHWANDT et al is such that the solid electrolyte is substantially chemically stable giving the claim language its broadest reasonable interpretation. As disclosed by the applicant, since there is no change in oxygen concentration during processing and most metal manufacturers will presumably report impurity concentrations of its metal,

including the concentration of oxygen, then the oxygen content or distribution in SCHWANDT et al would also have thereby been inherently sufficient to fulfill the requirements of the instant application by simply looking at the material data sheet for its purchased metal. Moreover, the desirable amount of oxygen would be inherent to the functioning sensor. In the alternative, as disclosed by the applicant in multiple locations (both the remarks and specification), the oxygen level of the used zirconium is that of a commercial product. Therefore, the broadest reasonable interpretation of the zirconium used is that of a commercial product would also be used in SCHWANDT et al; where the level would be known. Furthermore, the range of oxygen present is an open ended range in the direction of increasing oxygen content. Therefore, it would have been obvious to try and most likely to choose a zirconium material with an oxygen content greater than that of 1010 ppm as there would be more available commercial products with oxygen contents in a larger range. The application of the voltage to the sensor is discussed in the section regarding "Measurements and Results".

6. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over SCHWANDT et al (C. Schwandt, D.J. Fray, M.P. Hills, M.A. Henson, R.M. Henson and C. Powell, 6<sup>th</sup> International American Foundry Society Conference, Orlando, FL, 2001. American Foundry Society), in view of KIODE et al (US 5,445,725).

Regarding claim 13, SCHWANDT et al doesn't teach the specific material used to create the cavity discussed for packing the counter reference electrode.

KOIDE et al discloses the use of a glass sealing material for use to keep the reference electrode sensor gas tight as disclosed in column 6, lines 53-57.

At the time of the invention, it would have been obvious to utilize the sealant of KOIDE et al for the detection sensor of SCHWANDT et al because both seek to create an air tight seal and use of the sealant of KOIDE et al in the sensor of SCHWANDT et al will cause the same predictable result of air tight sealing as in use in KOIDE et al.

7. Claims 14 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over SCHWANDT et al (C. Schwandt, D.J. Fray, M.P. Hills, M.A. Henson, R.M. Henson and C. Powell, 6<sup>th</sup> International American Foundry Society Conference, Orlando, FL, 2001. American Foundry Society) and KOIDE et al (US 5,445,725) as applied to claim 13 above, as evidenced by FERRO ("Electronic and Specialty Glass: Low Temperature Sealing." Ferro Corporation. 2008. 11 Apr. 2008 <<http://www.ferro.com/our+products/electronic/products+and+markets/electronic+and+specialty+glass/low-temperature+sealing.htm>>.)

KOIDE et al teaches the use of a glass sealant to create the air-tight sensor of SCHWANDT et al and discloses all the necessary elements of claims 1 and 13.

The combination of KOIDE et al and SCHWANDT et al does not teach the use of a specific type of glass.

There are a very large number of low temperature sealant products evidenced by the Ferro Corporation extensive list shown including product EG 2759 which is used with glass substrates like that of the sensor tubing. This sealant, as shown in the information regarding the product, functions as a glass sealant containing no silicon and borate, a boron oxide, with a low temperature. These types of sealants are very common in the industry and is just one example of those offered by one company. Regarding claim 29, it would have been obvious to one of ordinary skill in the art to select a sealant with a melting temperature lower than 1200 degrees Celsius because the current operation of the sensor is only up to 800 degrees Celsius, therefore a melting temperature higher than that is unnecessary.

At the time of invention, it would be obvious to use the sealant of the FERRO Company as a substitute for the glass sealant used in the combination of KOIDE et al and SCHWANDT et al because the simple substitution of materials which function the same way would create a predictable result.

8. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over SCHWANDT et al (C. Schwandt, D.J. Fray, M.P. Hills, M.A. Henson, R.M. Henson and C. Powell, 6<sup>th</sup> International American Foundry Society Conference, Orlando, FL,

2001. American Foundry Society) and KOIDE et al (US 5,445,725) as applied to claim 13 above, and further in view of BODE (US 4,174,258).

KOIDE et al teaches the use of a glass sealant to create the air-tight sensor of SCHWANDT et al and discloses all the necessary elements of claims 1 and 13.

The combination of KOIDE et al and SCHWANDT et al does not teach the use of a protective film, or inert packing, within the sensor.

BODE teaches an electrolyte gas sensor which uses a protective means 13. Figure 2 shows the protective means to fill the balance of the sensor. BODE teaches the protective material to contain oxide metals including that of yttrium. (c. 4, l. 4-19) BODE shows the protective member to be a liner or located inside the sensor chamber, therefore between the inside or electrode member of ALBERTI et al and the sealant disclosed on the outside of the electrode of KOIDE et al.

At the time of invention, it would be obvious to fill the sensor chamber, as disclosed in BODE, in the sensor as disclosed by SCHWANDT et al and KOIDE et al because the material is used to maintain a constant partial pressure of gas within the sensor chamber (c. 4, l. 1-3), just as is required by an effective reference electrode through constant partial pressure.

Art Unit: 1724

9. Claims 32-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over SCHWANDT et al (C. Schwandt, D.J. Fray, M.P. Hills, M.A. Henson, R.M. Henson and C. Powell, 6<sup>th</sup> International American Foundry Society Conference, Orlando, FL, 2001. American Foundry Society) in view of ALBERTI et al (5,344,548).

Regarding claims 32 and 33, SCHWANDT et al teaches a hydrogen sensor for use in molten aluminum and its alloys in the abstract. The second full paragraph in the section titled “The Novel Hydrogen Analyser”, the sensor is said to have a perovskite electrolyte in conjunction with a zirconium/hydrogen mixture, operating at a temperature above 550 degrees Celsius. A seal is shown to be used in figure 1. SCHWANDT et al teaches in the second paragraph of section “The novel Hydrogen Analyser” for two phases of  $\beta$  and  $\delta$  zirconium will be present. Since these two phases will be present, it is inherent the necessary amount of hydrogen is sufficiently present. Since SCHWANDT et al discloses a fully functioning sensor (see fig. 1 and 3), the content of oxygen in SCHWANDT et al is such that the solid electrolyte is substantially chemically stable giving the claim language its broadest reasonable interpretation. As disclosed by the applicant, since there is no change in oxygen concentration during processing and most metal manufacturers will presumably report impurity concentrations of its metal, including the concentration of oxygen, then the oxygen content or distribution in SCHWANDT et al would also have thereby been inherently sufficient to fulfill the requirements of the instant application by simply looking at the material data sheet for its purchased metal, be it the zirconium of SCHWANDT et al or the

titanium as in ALBERTI et al. Moreover, the desirable amount of oxygen would be inherent to the functioning sensor. In the alternative, as disclosed by the applicant in multiple locations (both the remarks and specification), the oxygen level of the used zirconium is that of a commercial product. Therefore, the broadest reasonable interpretation of the zirconium used is that of a commercial product would also be used in SCHWANDT et al; where the level would be known.

ALBERTI et al teaches the use of titanium hydrides in reference electrodes in column 3, lines 7-15, processed the same way as in SCHWANDT et al and in the instant application. Since they are processed the same way, the same characteristics will inherently be present.

At the time of the invention, it would have been obvious to one of ordinary skill to substitute or utilize the titanium hydride material of ALBERTI et al for the zirconium material SCHWANDT et al because they are taught in column 2, lines 40-46, column 3, lines 6-15 of ALBERTI et al to both be good protonic conductors for use in reference electrodes. When substituted, the same level of known oxygen as discussed above, would apply to the titanium as it would the zirconium.

Regarding claim 33, as disclosed by the applicant, since there is no change in oxygen concentration during processing and most metal manufacturers will presumably report impurity concentrations of its metal, including the concentration of oxygen, then the oxygen content or distribution in SCHWANDT et al would also have thereby been inherently sufficient to fulfill the requirements of the instant application by simply looking at the material data sheet for its purchased metal. Moreover, the desirable amount of oxygen would be inherent to the functioning sensor. In the alternative, as disclosed by the applicant in multiple locations (both the remarks and specification), the oxygen level of the used zirconium or titanium is that of a commercial product. Therefore, the broadest reasonable interpretation of the titanium used is that of a commercial product would also be used in SCHWANDT et al and ALBERTI et al, where the level would be known. Furthermore, the range of oxygen present is an open ended range in the direction of increasing oxygen content. Therefore, it would have been obvious to try and most likely to choose a titanium material with an oxygen content greater than that of 1780 ppm as there would be more available commercial products with oxygen contents in a larger range.

Regarding claims 34 and 35, SCHWANDT et al teaches a calcium zirconate partially substituted or doped in the second paragraph of the section "The Novel Hydrogen Analyser".

Regarding claim 36, in the second paragraph of section “The novel Hydrogen Analyser” the two phases of  $\beta$  and  $\delta$  zirconium will be present. Moreover, since the same processing of the titanium material is performed in SCHWANDT et al, ALBERTI et al and the instant application, the same phases would be present in all three.

Regarding claim 37, SCHWANDT et al teaches a hydrogen sensor for use in molten aluminum and its alloys in the abstract. The second full paragraph in the section titled “The Novel Hydrogen Analyser”, the sensor is said to have a perovskite electrolyte in conjunction with a zirconium/hydrogen mixture, operating at a temperature above 550 degrees Celsius. A seal is shown to be used in figure 1. SCHWANDT et al teaches in the second paragraph of section “The novel Hydrogen Analyser” for two phases of  $\beta$  and  $\delta$  zirconium will be present. Since these two phases will be present, it is inherent the necessary amount of hydrogen is sufficiently present. Since SCHWANDT et al discloses a fully functioning sensor (see fig. 1 and 3), the content of oxygen in SCHWANDT et al is such that the solid electrolyte is substantially chemically stable giving the claim language its broadest reasonable interpretation. As disclosed by the applicant, since there is no change in oxygen concentration during processing and most metal manufacturers will presumably report impurity concentrations of its metal, including the concentration of oxygen, then the oxygen content or distribution in SCHWANDT et al would also have thereby been inherently sufficient to fulfill the

requirements of the instant application by simply looking at the material data sheet for its purchased metal. Moreover, the desirable amount of oxygen would be inherent to the functioning sensor. Therefore, the broadest reasonable interpretation of the zirconium used is that of a commercial product would also be used in SCHWANDT et al, where the level would be known.

SCHWANDT et al does not disclose the use of titanium or hafnium explicitly.

ALBERTI et al teaches the use of titanium hydrides in reference electrodes in column 3, lines 7-15, processed the same way as in SCHWANDT et al and in the instant application. Since they are processed the same way, the same characteristics will inherently be present.

At the time of the invention, it would have been obvious to one of ordinary skill to substitute or utilize the titanium hydride material of ALBERTI et al for the zirconium material SCHWANDT et al because they are taught in column 2, lines 40-46, column 3, lines 6-15 of ALBERTI et al to both be good protonic conductors for use in reference electrodes.

***Response to Arguments***

10. Applicant's arguments with respect to claims 1 and 21 have been considered but are moot in view of the new ground(s) of rejection based on the amendments supplied within the filing of November 5, 2010.

***Conclusion***

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KOURTNEY R. SALZMAN whose telephone number is (571)270-5117. The examiner can normally be reached on Monday to Thursday 6:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1724

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/  
Supervisory Patent Examiner, Art Unit 1753

Krs  
1/12/11